

NASA'S MARS MISSIONS - A STEP TOWARDS THE FUTURE

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Abstract: *Investigating space exploration while studying IT? Exactly! In the century of huge scientific evolution and impactful changes, it is important to be aware of what is happening around us, because through that we will be able to grasp the possibilities for the future.*

The article describes precisely 5 of the most interesting NASA missions from the perspective of two Technical University students. After analyzing several articles, we have decided to share with you structured concepts in an intelligible language which will give you an elucidate idea about the miracles NASA is creating in this huge and mysterious world.

Key words: *Mars, space, STEM education, research, progress, information, analysis.*

Introduction and Background

National Aeronautics and Space Administration started in 1957 when the Soviet satellite Sputnik was launched. The U.S government agency concentrates its human resources on science and technology related to space. In other words, its main goal is to oversee U.S universe exploration and aeronautics research.

The NASA activity is an incredible and immense field that gathers together scientific researches which are conducted by astronauts, space probes which study the solar system, satellites which explore the Earth and worldwide process of experience sharing which keeps people informed.

Let's see what information we have gained:

1. NASA helps teachers to prepare students who will become future NASA workers.
2. The agency offers various trainings to increase the professional status of teachers and to help them in the development of new study methods of STEM education (science, technology, engineering and mathematics).
3. The purpose of involving students in NASA missions aims at the increasing of motivation and achieving some practical skills.

As you can see NASA is not just a space agency that are doing multitude of interesting experiments but it is also a learning space for those who want to develop practical skills in technical fields.

The NASA progress is overwhelming, its robotic space probes have visited every planet in the solar system and other celestial bodies. Telescopes allowed scientist to look at the far reaches of space. Satellites have given a huge quantity of useful information about the Earth which led to a better understanding of some Earth's processes, for instance weather patterns.

The main informational source about our planet and the space is clearly the National Aeronautics and Space Administration whose role is vital for the humanity existence and scientific development

NASA: A new hope for the future

Since 1960, humankind has launched dozens of missions to Mars in an effort to get to know our planetary neighbour better [1]. Some of the missions were flybys, gathering brief information, others were long-standing orbiters that lasted years as they travelled around the Red Planet.

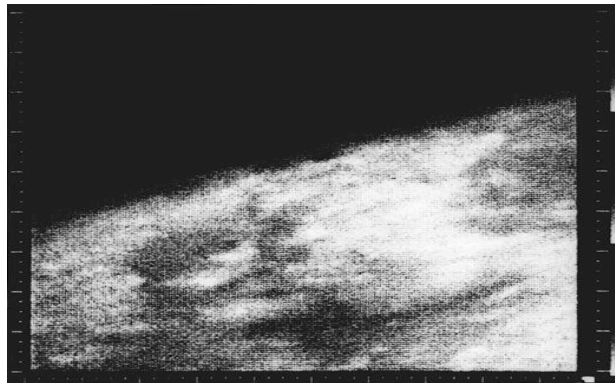
NASA's Mars Exploration Program, a science-driven, technological study of Mars as a planetary system in order to understand the formation and early evolution of Mars as a planet, the history of geological and climate processes that have shaped Mars through time, the potential for Mars to have hosted life, the future exploration of Mars by humans, and how Mars compares to and contrasts with Earth.

The goal of the Mars Exploration Program is to explore Mars and to provide a continuous flow of scientific information and discovery through a carefully selected series of robotic orbiters, landers and mobile laboratories interconnected by a high Mars/Earth communications network, which is why we feel like the footprint of these missions is one not to be missed, as well as it is a complete honour to live in the present moment when such a scientific revolution is happening right before our eyes.

I. First successful mission

The first attempts to reach Mars happened near the beginning of space exploration. More formally known as the Union of Soviet Socialist Republics (USSR) at the time, the Soviet Union made multiple attempts in the 1960s to reach the Red Planet, and NASA soon followed with its Mariner 3 spacecraft.

While those first several missions didn't reach their target, NASA's [Mariner 4](#) finally did. The spacecraft launched on Nov. 28, 1964, and was the first to fly by Mars on July 14, 1965 [2]. It sent 21 photos of the Red Planet back to Earth (Figure 1).



**Figure 1. The first close-up image ever taken of Mars
(Source: NASA)**

Two days after Mariner 4 launched, the Soviet Union tried again with Zond 2. The spacecraft passed by Mars but the radio failed and it did not return any planetary data.

II. Viking

When NASA's Viking 1 probe touched-down on Mars in July 1976, it was the first time a man-made object had soft-landed on the red planet. The Viking 1 lander also holds the title of longest-running Mars surface mission, with a total duration of 6 years and 116 days. The spacecraft also sent the first colour pictures back from the Martian surface, showing us what that mysterious red dot looks like from the ground for the first time in human history [3].

III. 2001 Mars Odyssey

The Odyssey mission is NASA's longest-lasting spacecraft at Mars. It was launched on April 7, 2001 and its main purpose was to make the first global map of the amount and distribution of chemical elements and minerals which are contained in the Martian surface [4]. The collected information has given scientists the opportunity to identify the regions with buried water ice. Moreover, spectacular views of Martian topography have been provided by the images that measure the surface temperature. Odyssey determined that radiation in low-Mars orbit is twice that in low-Earth orbit. Also, pictures and other measurements helped to identify potential landing sites for rovers and landers.

IV. Phoenix Mars Lander

During the course of its three-month mission, Phoenix dug into an ice-rich layer near the surface (“Figure 2”). The purpose was to check samples of soil and ice for evidence about whether the site was ever hospitable to life. Phoenix landed farther north than any previous NASA missions and it was the first chosen for Scout program, an initiative for smaller, lower-cost, competed spacecraft. It carried tiny ovens and a portable laboratory in order to analyze soil samples collected



Figure 2. View underneath lander towards south foot pad, showing patchy exposures of a bright surface, possibly ice (Source: NASA)

by its robotic arm. To refresh the understanding of Martian air processes, the atmosphere was scanned up to 20 kilometres in altitude, providing important data about the formation, duration and movements of clouds, fog and dust plumes. The temperature and pressure sensors were also carried [5]. "The Phoenix spacecraft succeeded in its investigations and exceeded its planned lifetime," said F. Li, manager of the Mars Exploration Program at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "Although its work is finished, analysis of information from Phoenix's science activities will continue for some time to come."

V. Mars Reconnaissance Orbiter

NASA's Reconnaissance Orbiter was launched in August, 2005 and carried the most powerful camera ever flown on a planetary exploration. It was capable to provide not only an astoundingly detailed view of the geology and structure of Mars, but helped identify obstacles that could jeopardize the safety of future landers and rovers. It also carried a sounder to find subsurface water which is definitely an important consideration in selecting scientifically worthy landing sites for future exploration [6]. Other science instruments which were present on the Reconnaissance Orbiter identified the way of dust and water transportation in the Martian atmosphere. The second camera provided a broader geological and meteorological context for more detailed observations from higher-resolution instruments. The Mars Reconnaissance Orbiter was the first instalment of an «interplanetary Internet», a crucial service for future spacecraft.

Conclusion

Humanity has gazed at Mars for centuries, dreaming of what might lie on its dust-orange surface. As our telescopes improved, so did our picture of the Red Planet, which can be easily seen in the pictures taken during the missions presented above.

Mars is an obvious target for exploration because it is close by in our Solar System, but there are many more reasons to explore the Red Planet. The scientific reasons for going to Mars can be summarized by the search for life, understanding the surface and the planet's evolution, and preparing for future human exploration. But why do we keep going to Mars specifically? Understanding whether life existed elsewhere in the Universe beyond Earth is a fundamental question of humankind. Mars is an excellent place to investigate this question because it is the

most similar planet to Earth in the Solar System. Evidence suggests that Mars was once full of water, warmer and had a thicker atmosphere, offering a potentially habitable environment.

The 2000s saw big advances in Mars exploration, but the new decade may bring even more exciting Red Planet news.

“Mars has been flown by, orbited, smacked into, radar examined, and rocketed onto, as well as bounced upon, rolled over, shoveled, drilled into, baked and even blasted. Still to come: Mars being stepped on.”

— Buzz Aldrin

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